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NAVY'S LAMPS (LIGHT AIRBORNE MULTI-PURPOSE SYSTEM)

PRIME CONTRACTOR MANAGEMENT: AN EXPLANATION AND DISCUSSION

DEFENSE SYSTEMS MANAGEMENT SCHOOL

NOVEMBER 1974

DEFENSE SYSTEMS MANAGEMENT SCHOOL

PROGRAM MANAGEMENT COURSE
INDIVIDUAL STUDY PROGRAM

NAVY'S LAMPS (LIGHT AIRBORNE
MULTI-PURPOSE SYSTEM)
PRIME CONTRACTOR MANAGEMENT:
AN EXPLANATION AND DISCUSSION

STUDY PROJECT REPORT
PMC 74-2

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BOLINO

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DEFENSE SYSTEMS MANAGEMENT SCHOOL

STUDY TITLE: NAVY'S LAMPS (LIGHT AIRBORNE MULTI-PURPOSE SYSTEM) PRIME CONTRACTOR MANAGEMENT: AN EXPLANATION AND DISCUSSION

STUDY PROJECT GOALS:

To explain how the contractor selected by the Navy to be the system prime on LAMPS intends to manage its integration and development.

To discuss the strengths and weaknesses in the contractor's management approach as presented in his proposal.

STUDY REPORT ABSTRACT

The study report gives some background concerning the navy's desire to hire a system prime contractor for its LAMPS program. The government's Request-For-Quotation is reviewed for orientation before the contractor's proposal for management of the development is discussed. Major areas are described and related to management concepts obtained from management literature. The report illustrates some of the current management techniques being used in the defense industry.

KEY WORDS

MATERIEL ACQUISITION LAMPS INTEGRATED LOGISTICS SUPPORT

PROJECT MANAGEMENT

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NAVY'S LAMPS (LIGHT AIRBORNE MULTI-PURPOSE SYSTEM) PRIME CONTRACTOR MANAGEMENT: AN EXPLANATION AND DISCUSSION

Study Project Report
Individual Study Program

Defense Systems Management School
Program Management Course
Class 74-2

by

John V. Bolino
GS-14 DNC

November 1974

Study Project Advisor
Mr. Fred Kelley

EXECUTIVE SUMMARY

The purpose of this study project was to examine the methods being used by a major industrial concern in managing the development of a highly complex weapon system. The approach being employed by the International Business Machines Corporation (IBM) in their role as the System Prime Contractor (SPC) for the navy's Light Airborne Multi-Purpose System (LAMPS) was chosen.

The study focuses on the management techniques proposed by the contractor that were a major factor in his being selected over three other highly qualified firms. The study is important as an example of current management thinking within the navy department and defense industry -- the contract having just been signed in the spring of this year (1974). Also, during the course of the effort the writer was notified of his transfer to the project office under study, thereby heightening the level of personal importance.

First, liaison was established with the LAMPS project office in Jefferson Plaza. There access was gained to the project Development Concept Paper (DCP) and the Request for Quotation (RFQ) for their System Prime Contractor. The IBM project office in Jefferson Plaza provided use of the company's proposal.

The DCP gave insight into the philosophy behind the requirements in the government's request to industry. The RFQ established the work to be done and constraints to be considered.

The IBM proposal was quite large. It consisted of four volumes: the Management Volume, the Technical Volume, the Cost/Price Volume and a Documentation Volume. Attention was focused on the Management Volume and its twelve sections. The major areas of that volume were then studied and analyzed in relation to management theories existing in text books and business articles.

Although most of the techniques presented are similar to those commonly seen throughout the defense industry, there were some interesting innovations being applied that may be of value to other programs. The most pervasive technique was one of locating the company's Deputy Project Manager in an office virtually adjoining the navy's project office. This was possible because of the commercial quarters being utilized by the navy. The communication and coordination enhancement that has resulted from this arrangement is already being seen by the project office.

The contractor, as might be expected, is also extensively applying automatic data processing capability to the tracking of costs, schedules, performance configuration nd logistics. The existence of company models in all of these areas, that need only to be tailored for the LAMPS applications, greatly reduces the time required to bring this capability into service.

The use of joint government/contractor boards to manage change and to integrate logistics efforts is presented as an effective means of keeping contractor furnished and government furnished equipments compatible.

ACKNOWLEDGMENTS

The writer would like to thank the following individuals for their assistance in the preparation of this study project report:

Mr. Fred Kelley - DSMS Study Project Advisor

Captain Roger Boh - LAMPS Project Manager

Commander George Skezas - LAMPS Systems Engineering Officer

Mr. Barry Macalady - IBM Deputy Project Manager for LAMPS

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INTRODUCTION

The navy has long recognized the need to provide its destroyer fleet with more offensive capability against submarines and more defensive capability against missile attack. Pursuant to this need, the navy developed and put into operation the Drone Anti-Submarine Helicopter (DASH) system. Difficulties with reliable control of this unmanned helicopter has led to the initiation of a development program to provide manned helicopter support for destroyers and other escort ships. The program has been designated LAMPS for Light Airborne Multi-Purpose System.

In the summer of 1973, the Defense System Acquisition Review Council (DSARC) concurred with the navy's recommendation to proceed into full scale development of the system and supported the "bringing on board" of an industrial system integrator who could eventually replace the navy laboratory currently charged with this responsibility. At that time, the Naval Air Development Center had been performing the system integration function and was expected to continue through pilot production.

When in the fall of 1973 the Chief of Naval Operations issued requirements for an expansion of the LAMPS mission, a decision was made:

a.) to accelerate the effort to acquire an industrial focal point for integration of the many sub-systems.
b.) to expand the role of this industrial source to system prime contractor with eventual total system responsibility.

c.) to direct the contractor's attention to the new requirements and the need for system re-definition.
d.) to plan for an earlier transition from NADC to a system prime contractor for integration control.

Everyone was aware that the LAMPS concept involved integration problems unlike those previously faced in naval aviation. It brought together in an intimacy never before required the "black shoe navy" (shipboard personnel) and the "brown shoe navy" (aviation personnel). Incompatibilities between these two groups would be magnified and accentuated because of the close team work necessary to create the synergistic effect expected of the air-ship team. The environment would be much different from that existing on an aircraft carrier where aircraft are operated in groups and ship-to-air coordination is less critical. The aircraft was now an extension of the ship and almost constantly under its control.

Logistics considerations were enormous in scope. The traditional advantages of consolidated maintenance and supply for naval aircraft were no longer applicable. Training was also complicated by the dispersion of operating units. It was obvious that some new concepts in integrated logistics support would have to be developed within the aviation community. To help solve the myriad of problems anticipated with implementing this concept into an efficient and effective weapon system, the navy now sought industry. (1:4-2)

A Request for Quotation (RFQ) was issued in November 1973. Four major corporations responded: IBM, Grumman, General Electric and Sperry. Selection was based on a combination of factors

which included management, technical approach and cost. The successful contractor was IBM Corporation. (2:1-1)

The IBM proposal consisted of a Management Volume, a Technical Volume, a Documentation Volume and a Cost/Price Volume. The Management Volume consisted of twelve sections dealing with various facets of the program. This study will illustrate the key elements of the management plan and discuss the relationship between the proposed approaches and published management theory. An attempt will be made to predict the degree of success that one might expect from the techniques proposed. The use of fundamentals and innovations will be illuminated and discussed from an academic viewpoint.

Unfortunately, the contract has not been in effect long enough to observe any results of consequence. It should be noted, however, that in discussion with personnel in the navy project office it was indicated that performance to date has been most encouraging and that the communication facilitated by the close proximity of cognizant contractor personnel has been most effective. Coordination of government and contractor efforts in pursuit of the program are expected to be excellent throughout the development as a result of the effectiveness of the communication system that has been established.

Study Project Methodology

In order to establish a foundation for study of the contractor's management approach, I felt it necessary to investigate in some depth the evolution of the navy's requirements. Through the cooperation of the LAMPS project office, I was able to obtain a copy of Development Concept Paper (DCP) Number 85. This is the DCP which covers development of the LAMPS and which was approved last summer by the Defense Acquisition Review Council (DSARC). It contained a plan to transition primary responsibility for system integration from the Naval Air Development Center to an industrial source.

This then provided the basis for the government's request to industry. Although the phasing, scope and focus of the contractor's role was subsequently modified by the expanded requirements imposed by the Chief of Naval Operations in the fall of that year, the plan to "bring industry on board" was rooted in the DCP. (3:10)

The navy's Request for Quotation (RFQ) contained some challenging requirements, as can be seen in the contract statement of work. (Figure 1) The contractor is given the opportunity to revise government specifications so that he can be required to warrant performance equal to or exceeding those specifications. This is a necessary pre-condition to the application of the Total System Responsibility clause

SCHEDULE

SECTION E - SUPPLIES OR SERVICES AND ESTIMATED COST AND FEE

Item	Supplies or Services	Total Estimated Cost
0001	Revised LAMPS MK-III Major Subsystem Integrated Specification	
0002	List of Candidate Equipments	
0003	Aircraft and Shipboard Computer Software	
0004	Integrated Test Plan for Selected Candidate Equipments	
0005	Integration and Installation of CFE and GFE into Prototype System	
0006	Demonstration of the Prototype System	
0007	Pilot Production System Specifications and Documentation	
0008	Reliability and Maintainability Program	
0009	Systems Management	
0010	Technical Assistance for the NADC H-2 Test Program	
0011	Technical Data for Items 0001 thru 0010	(See Exhibit A)
0012	Financial and Administrative Data	(See Exhibit B)

Total Estimated Cost	$ 13,052,331.00
Fixed Fee	$ 783,163.00
Total Estimated Cost plus Fixed Fee	$ 13,835,494.00

Figure 1

in pilot production (Phase II). Under the development contract, (Phase I) the contractor would be required to perform corrective action to specifications or hardware to an extent not to exceed $400,000. (Figure 2) The Total System Responsibility clause (Figure 3) to be applied in the pilot production contract would share corrective action on a 50/50 basis until zero fee had been reached. Thereafter, further corrective action would be performed without fee and without any increase in cost.

The contractor was required to develop interface agreements between himself and the suppliers of government furnished equipment, which was to be integrated into the LAMPS. (Figure 4) He would not be allowed to make personnel changes without notifying the government and justifying the equivalency of the replacement. (Figure 5)

Other parts of the RFQ also support the tone of the navy's desire to hire a contractor who would prepare himself managerially, as well as, technically to take overall responsibility for the ability of the LAMPS to meet requirements.

Throughout the study, management literature was consulted in those areas that corresponded to points developed in the IBM management proposal. Books and articles were the primary source of academic material with particular use of material dealing with project management.

N00019-74-C-0415

SCHEDULE

J-15 ASSUMPTION OF TOTAL SYSTEM RESPONSIBILITY.

A. The Contractor shall assume total System Responsibility in the Fleet environment if awarded a contract for Phases II and III. Such total System Responsibility shall be implemented in accordance with Section J-16 Total System Responsibility which the parties agree shall be the minimum requirement incorporated into any Phase II and Phase II contract for the LAMPS MK-III System.

B. Upon the completion of this contract the Contractor agrees, as requested by the Government, to perform corrective action (which shall not be subject to reimbursement by the Government) or reimburse the Government for Government corrective action to correct any defect in Contractor refined and/ - revised specifications, or in a system produced in adherence to t. ose specifications, resulting in failure to meet desired characteristics that were predicted as a result of performa ce of this contract. However, Contractor shall not be required to perform such corrective action, to an extent in excess of, or reimburse the Government in an amount in excess of $400 000. To the extent that corrective action is performed in excess of $400, 000 such corrective action shall be contracted for separately. This subparagraph shall be superseded and replaced by applicable portions of paragraph J-16 in the event the Contractor is awarded a Phase II contract.

Figure 2

SCHEDULE

J-16 TOTAL SYSTEM RESPONSIBILITY
(This clause is to be incorporated into any Phase II and III Contract)

(a) The Contractor has represented and this contract has been executed on the basis that the Contractor has reviewed, refined and substantially revised the specifications (which term includes drawings) recited in Section F of this contract entitled "Description or Specifications." Such specifications set forth the performance requirements for the Contractor's proposed LAMPS MK-III System. Accordingly, notwithstanding any conflict or inconsistency which hereafter may be found between achievement of the aforesaid performance requirements and adherence to the Contractor's proposed design for the LAMPS MK-III, the Contractor hereby warrants that the LAMPS MK-III to be delivered or performed hereunder will meet or exceed the performance requirements of the said specifications.

(b) The Contractor hereby acknowledges that it has no right to assert against the Government, its officers, agents or employees, any claims or demands with respect to the aforesaid specifications as are in effect on the date of award of this contract (i) based upon impossibility of performance; defective, inaccurate, unfeasible, insufficient or invalid specifications; implied warranties of suitability of such specifications; or (ii) otherwise derived from the aforesaid specifications, and hereby waives any claims or demands so based or derived as might otherwise arise.

(c) Notwithstanding the "Changes" clause or any other clause of this contract, the Contractor hereby agrees that no changes to aforesaid specifications which may be necessary to permit achievement of the performan requirements or any other technical requirements not inconsistent with such performance requirements specified herein for the Contractor's proposed LAMPS MK-III System shall entitle the Contractor either to any increase in the negotiated total est cost or fixed fee as set forth in Sec E of this contract entitled "Supplies or Services" or to any extension of the delivery times for the LAMPS MK-III System beyond those set forth in Section H of this contract entitled "Deliveries or Performance," except as set forth in subparagraphs (d), (e), and (f).

(d) The Contractor shall during any Phase II contract upon Government request performany corrective action required to make the system conform to performance specifications prepared during the Phase I contract.

Figure 3

SCHEDULE

The cost of Phase II corrective action shall be shared on a 50/50 basis between IBM and the Navy until a zero fee is reached. Thereafter, further corrective action shall be performed without fee and without any increase in the negotiated total estimated cost. This subparagraph shall, in addition to the provisions of other subparagraphs hereof, apply if the Government Furnished Equipments and/or Contractor Furnished Equipments meet their respective specifications, but when evaluated by a mutually agreed upon means, the system fails to meet total system performance due to defective Contractor refined and/or revised specifications.

(e) If Contractor is to furnish Contractor Furnished Equipments (CFE) under the Phase II and/or III contracts on a fixed-price basis, Contractor shall correct any CFE which fails to meet Contractor prepared, refined and/or revised specifications at no cost to the Government pursuant to an appropriate clause or clauses which shall be incorporated into the contract(s).

(f) During Phase III the Contractor shall, upon Government request, perform corrective action or reimburse the Government for Government corrective action (either of which will be subject to reimbursement of 50% of the costs up to a maximum agreed upon limit) resulting from deficiencies in LAMPS MK-III system specifications discovered during the first two years of Fleet operation. The Contractor warrants that he will correct at no cost to the Government, pursuant to an appropriate clause or clauses which shall be incorporated into the Phase III contract, all CFE in each system delivered under a Phase III contract for a period of two years after delivery.

Figure 3 (cont.)

N00019-74-C-0415

SCHEDULE

J-2 INTERFACE AGREEMENTS

The Contractor shall enter into binding interface agreements with sources furnishing equipment to the Government which is to be integrated into the LAMPS MK III System. Such agreements or relationships created shall not be considered "sub-contract" for purposes of the clause of the General Provisions entitled "Default".

Figure 4

N00019-74-C-0415

SCHEDULE

J-22 NOTICE OF PERSONNEL CHANGE

Volume II, Section VIII and Volume III, Section XII of the Contractor's proposal identified personnel assigned to the contract. If any of those personnel do not perform such assignment other personnel may be substituted, providing they have equivalent or superior qualifications, and providing the Contractor notifies PM-15 in writing, with a copy to the Procuring Contracting Officer (PCO), via the ACO (Administrative Contracting Officer). Such notification will provide when the personnel ceased to perform such assignment and the name, education and experience of his replacement, if any.

Figure 5

Project Management

IBM's project management organization featured:

a.) A strong dedicated project management team with extensive experience in system management.
b.) Interface management of associate contractor and GFE (Government Furnished Equipment) supplier relationships through Associate Contractor agreements.
c.) A deputy Program Manager with full authority resident at the navy project office.
d.) Full visibility of cost, schedule, and performance data.
e.) Continual interface with all Navy agencies with LAMPS responsibilities.

The company proposed a matrix organization of both project and functional structures. Project elements were to focus their attention on the specific program requirements and to provide skills needed throughout the life of the program. The line organization of supporting specialists would then receive technical direction from the appropriate project manager. This philosophy is designed to allow the project manager to obtain time-dependent services he requires and to release them from program accountability when they are no longer required. The functional organization applies skills across many programs in the most efficient manner. This organizational concept had proven effective on all of IBM's major programs. (Figure 6)

The company project manager is delegated full authority in a company charter and reports directly to the Assistant General Manager of the Electronics Systems Center of the Federal Systems Division. The Electronics Systems Center reports

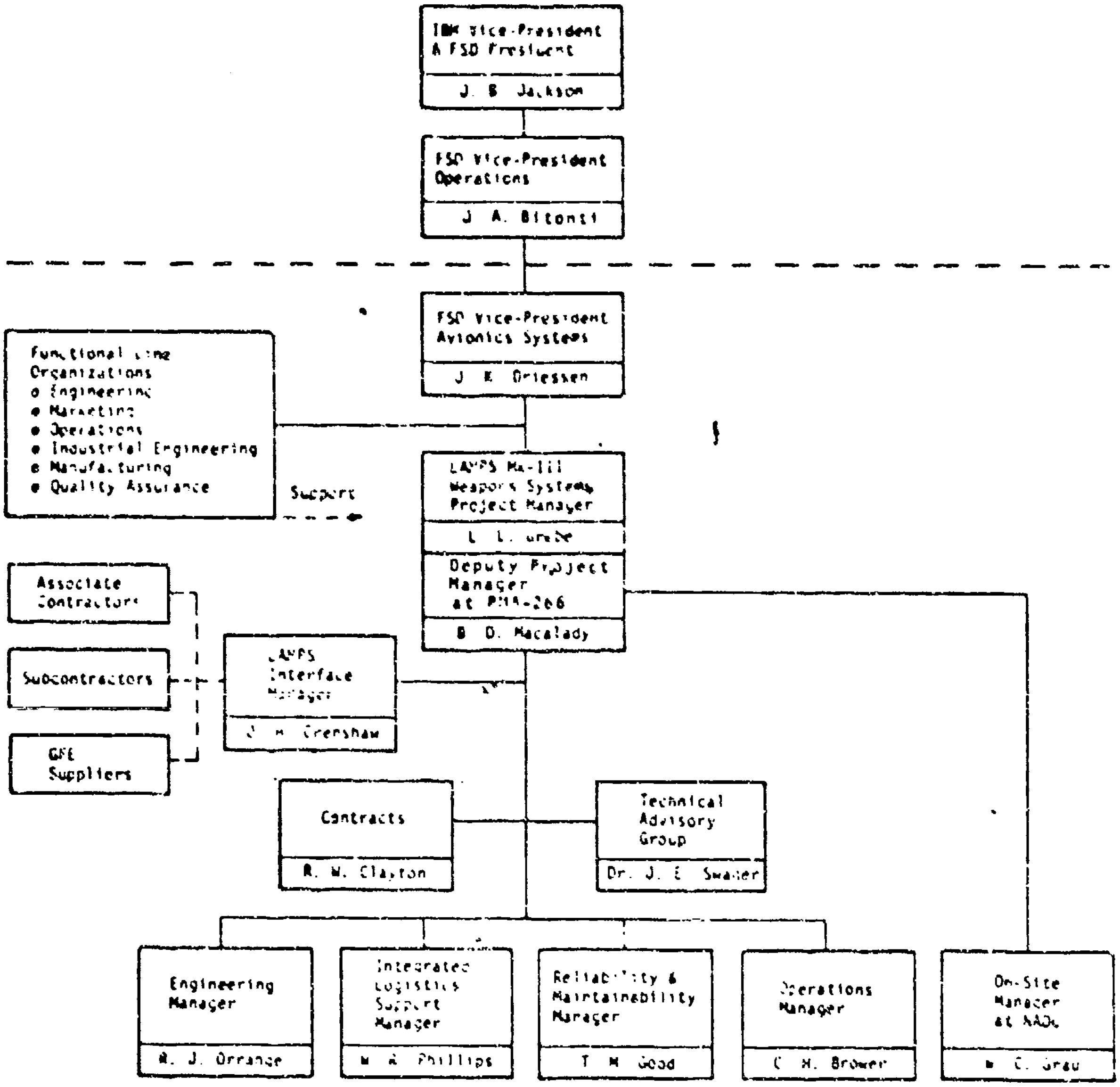
IBM Vice-President & FSD President
J. B. Jackson
FSD Vice-President Operations
J. A. Bitonti
FSD Vice-President Avionics Systems
J. K. Driessen
Functional Line Organizations
o Engineering
• Marketing
• Operations
• Industrial Engineering
• Manufacturing
• Quality Assurance
Support
LAMPS MK-III Weapons Systems Project Manager
Deputy Project Manager at PMA-266
B. D. Macalady
Associate Contractors
Subcontractors
GFE Suppliers
LAMPS Interface Manager
J. H. Crenshaw
Contracts
R. W. Clayton
Technical Advisory Group
Engineering Manager
R. J. Orrange
Integrated Logistics Support Manager
W. A. Phillips
Reliability & Maintainability Manager
T. M. Good
Operations Manager
C. H. Brower
On-Site Manager at NADC

Figure 6

to the President of the Federal Systems Division who is also a corporate Vice-President. A special audit group was created to review the LAMPS project quarterly and report directly to the President of the Federal Systems Division. This audit group was to be headed up by Federal Systems Division Vice-President for Technology.

The use of a Technical Advisory Group is a management technique that IBM is employing on major contracts. This group provides an independent assessment of system design to assist the project manager. The LAMPS Chief Scientist is chairman of the Technical Advisory Group, which consists of leading engineers and senior scientists from Electronics Systems Center, Federal Systems Center, and the Research Division. The group would be convened proceeding major program milestones to review hardware and software design. Recommendations would be formalized and submitted to the LAMPS project manager for consideration.

A Deputy Project Manager would be assigned to the navy project office. He would set up an office in close physical proximity so that he could function as an extension of the navy project office. The Deputy Project Manager will be supported by a select team of experienced personnel to provide quick response to customer problems. The group would assist in the preparation of presentations, draft correspondence, liaison with other navy offices, and provide access to program data available at the Electronics Systems Center. The

Deputy Project Manager would represent IBM on the Configuration Control Board, presenting the results of company investigations of proposed engineering changes and illuminating any effects on interface areas.

A conscious decision was made by the company to assign a Deputy Program Manager to support the navy project manager, rather than a normal liaison representative. It was anticipated that most requests would be met by on-site personnel; however, when necessary the Deputy Project Manager had full authority designated from the Project Manager to assign resources from any location to respond to navy requests.

A key member of the project office was to be the LAMPS Interface Manager. His position had been established to increase management involvement in those areas of the total system that require cooperative efforts between associate contractors, GFE suppliers and IBM subcontractors. He was to be responsible for personal contacts with program managers from each of the associate contractors, major GFE suppliers and subcontractors. The complexity of the industrial team that supports the LAMPS project required full time management. The Interface Manager would obtain management commitment for each of the subsystems from the appropriate industrial source, review cost targets and assess progress. He would be the chairman of IBM on-site reviews by teams of specialists ascertaining the sources' capability to achieve program objectives.

The contractor's proposed employment of a matrix

project organization to manage the program would, of course, seem logical to his navy customer. I was reminded of Per Jonason's statement after having observed a number of United States firms utilizing project management.

> Project management has had some spectacular successes, particularly in top-priority U. S. military (weaponry) and space (lunar exploration) programs. But despite its acclaim as another management miracle, project management -- as a corporate innovation -- has too often failed to live up to its advance notices. And this point has not received much publicity.
>
> Some companies that have adopted the project management approach already are verging on disillusionment; they have simply been unable to make it work. Until too late, they failed to realize that project management can be more trouble than it is worth unless its major problems are anticipated and dealt with before the system goes into operation. (4:13)

I was encouraged by the considerable experience the company had had in applying project management to other programs, and I noticed some innovations that could have been developed to deal with some of the problems associated with project management. The individuals selected for key positions within the project office had engineering and management backgrounds.

One cannot help but wonder whether these men possess the "different attitude regarding the classic management functions of control, coordination, communication and the setting of performance standards (5:50) that Paul Gaddis contends is needed by the project manager. He points out that he must know how to manage a high proportion of professionals who generally require an understanding of the "why" of tasks and

resist attempts to mandate the "how." He cautions, however, that although detailed supervision should not be imposed upon the professional worker, nonetheless, he should never be excused from the responsibility of having to produce in accordance with the exacting requirements of his profession.

Having placed competent individuals in the key positions within the project office, the contractor now proposed to locate the Deputy in close physical proximity to the navy's project office. This technique assures the close communication and working relationship that must be developed between customer and the supplier. It can help to build the trust so necessary to effective communications. It has been pointed out by T.M. Higham (6: 1-10) that in most studies of communication between individuals and groups scant recognition is given to what is, perhaps, the one fact which we do know from experience about it -- that if a person dislikes or mistrusts us, he is not likely to be receptive to what we have to say, and his version of our words is likely to be distorted by his personal opinion of us, or his preconceived notions about our motives. The occurrence of effective communication would, therefore, appear unlikely if not proceeded by feelings of trust among the participating parties.

Another key position established within the project office recognizes the need for effective cooperation with other contractors supplying Government Furnished Equipment for integration. The Interface Manager must have the broad

work experience and education that Lawrence and Lorsch contend are characteristic of effective integrators. (7:40)

Does he also have the personality traits that Lawrence and Lorsch maintain are equally important? Does he work well with people and seek opportunities for interaction? Is he verbally fluent? Enthusiastic? Imaginative? Assertative? Humorous? If the industry team that will be brought together to accomplish the LAMPS development is to be effective, the Interface Manager of the system prime contractor will have to be the epitome of the "effective integrator." He must be able to generate the inter-industry trust that is uncharacteristic of the highly competitive environment of defense industry. Can he convince traditional rivals that all will benefit appropriately from success of the program?

Likert (8:42-49) talks of the need for the development of a supportive relationship where each group sees an experience as contributing to their sense of personal worth and importance. In a sense, the Interface Manager must create this condition between his company and the other major suppliers.

This position will have to be evaluated regularly by government personnel. It will need much support in its dealings with GFE suppliers from within the company and within the navy.

Design-to-Cost Management

IBM reasoned that Design-to-Cost management would be very similar to a continuing vigorous value engineering program. They sited many instances on previous contracts where value engineering change proposals resulted in substantial cost savings without performance degradation.

Professional estimators would begin by analyzing the technology involved, labor required, test and manufacturing methods and other factors which would combine to give cost figures. Allocations would then be made to the major subsystems and targets presented to each manager for his written concurrence prior to release of his budget. Each manager would maintain an individual performance plan to be reviewed regularly by the project manager. Employees would be motivated to participate by submitting creative ideas for reducing cost. Certificates, gifts and recognition are awarded on an internal point system. 2400 awards were made in 1973.

IBM recognized that early in the program agreement must be made between the contractor and the navy on realizable cost thresholds; minimization of support costs to be considered as well as acquisition costs. Cost and performance must have equal priority in system design. Prioritization of performance functions would be necessary to assist design teams in consideration of trade-offs.

Design teams would review military standards and specifications for requirements that impact substantially on hard-

ware cost and assess operational utility. Waivers must be obtained where appropriate if cost were to be minimized. Company studies had shown considerable cost savings possible by designing directly to conditions in which the equipment was expected to operate, rather than to military standards. The contractor would also analyze Government Furnished Equipment (GFE) and recommend elimination of unnecessary requirements adversely impacting cost.

A review board would meet weekly to review cost problems. The board to consist of the program office, system engineering, design engineering and manufacturing engineering. A decision would be made by the board to either:

a.) stay with the performance and accept the cost
b.) implement a less expensive method and accept less performance
c.) redesign the function

If (a) is chosen, reallocation of the cost goals must be made to maintain overall system cost. If (b) is chosen, performance requirements must be reallocated to maintain performance thresholds. Should (c) be chosen, schedule impact must be assessed and necessary adjustments made to maintain overall schedule constraints.

The board would only consider problems and not interfere with individual engineer responsibilities within their goals. This policy was adopted in the interest of minimizing the "red tape" of board review.

Navy input would be sought, whenever overall goals were threatened, to consider substitution of equipments, alternate

configurations, deletion of functions and decisions on holding cost or performance. Government Furnished Equipment (GFE) suppliers would be assisted by IBM in identifying cost reduction approaches. Navy assistance would be necessary in accomplishing corrective action on GFE that impacted on system cost goals. IBM would make recommendations to the Configuration Control Board concerning effects of proposed changes on development, procurement and support costs. IBM has been successful in using software to compensate for hardware deficiencies and intended to continue to investigate this possibility to avoid expensive hardware changes.

Life Cycle Cost modeling was to be a part of the Design-to-Cost management effort. The company had a Life Cycle Cost model developed in accordance with the Department of Defense Life Cycle Costing Guide for System Acquisition. The model used estimates of failure rates, unit costs, utilization rates, projected lifetimes and logistic concepts in computing operating and support costs. Refinement of the LAMPS model would continue throughout the program as test data was acquired. Close Navy/Contractor coordination would be necessary in defining inputs. Cost impact of variances would be visible using the LCC model. Consequences of selecting alternatives could then be compared and assist the decision making process.

The company had obviously responded to the customer's concern about reducing the cost of acquiring, operating and supporting complex weapon systems. Department of Defense interest in reducing the cost of its future weapon systems is

at an unparalleled high. Nothing is sacred anymore. High performance is a dirty word. "Gold plating" is suspected at every turn. Standards and military specifications are being questioned as never before and "designing-to-cost" is becoming a way of life for defense contractors.

Intense management effort must be applied if technological levels within the company are to be influenced to question performance and treat cost as equal priority. Management must find motivating factors for scientific and technical personnel and not be misled by hygiene factors. The recognition element may be of considerably more value to this group than awards or prizes. It is interesting to note that research studies (9:194) that counterindicate Herzberg's satisfier-dissatisfier theory about job factors used populations of engineers, even though Herzberg's earlier studies were based on engineers. This would suggest that there exists a high degree of complexity inherent in trying to motivate professional workers such as engineers. I wonder whether the findings of Zaleznik, Christensen, and Roethlisberger might not be applicable. (10:352) They found that group membership or reward by the group was a major determinant of worker productivity while reward by management had no noticeable motivation effect. The company will need to constantly re-evaluate the degree of success that their approach is yielding and seek new and innovative methods if necessary.

The company is using the review board for decision making. Of course, groups can make decisions a number of ways. Research (11:51) has shown that on complex problem-solving tasks where

there is a single correct answer, groups using a consensus mode have been more effective than individuals (except in rare cases). It would be valuable to know which method the board will use to make its decisions, since unanimity is unlikely and authority rule self defeating. Major strategies for arriving at a decision are identified by Thompson and Tuden (12:496) with the suggestion that there is an appropriate structure for each one. They predict that problems will arise if an issue calling for one strategy is presented to a decision unit built to exercise a different kind of strategy.

We see the use of modeling by management to predict consequences of considered actions on life cycle costs. Modeling has become an extremely potent tool in the hands of those who know how to use it in management information systems (MIS). (13:386) IBM indicates that their Life Cycle Cost model is currently influencing design philosophy on the Trident submarine contract and assisting in the selection of components on an electronic warfare system contract. It appears that they have the knowledge to exploit the value of a predictive model such as they describe. Boulden and Buffa (14:21) argue that models designed to assist the decision maker must be on-line and real-time inorder to be effective, i.e., direct connection between the decision maker and the computer with nearly instantaneous response. Their experience has shown that managers will eagerly use a computer in decision making if it is fast, economical and easy to work with.

Only time will tell whether the Life Cycle Cost model will be actively utilized in making project decisions or whether it will become another expensive failure to marry computers and men in the management process.

Integrated Logistics Support (ILS) Management

IBM proposed to utilize a Weapon System Logistics Integration Board (WSLIB) consisting of government and contractor personnel to establish policy, shcedules and funding for the planning and implementation of ILS. The Board would be chaired by the Navy's Program Manager and have representatives from Air Systems Command, Ships Systems Command and the Development Laboratory. The IBM representative on the Board would have the authority to commit the company ILS organization to specific courses of action for the resolution of ILS problems. The IBM representative would be responsible for maintaining an Action Item Log and reporting the status of efforts to resolve identified problems in the ILS area.

An ILS manager was identified in the company project office on an equal level with the LAMPS Engineering Manager. The ILS manager would have a ILS planning and support engineering unit, a personnel and training unit, a technical manuals unit, and a supply support unit. Particular emphasis was placed on the fact that the ILS Manager was at an equal level with the Engineering Manager to provide for effective integration of logistics requirements into system design.

An ILS reporting system was proposed for implementing by IBM to track progress and status in pursuing the ILS Master Plan. The reporting system would use a central data bank and a Computer Interactive Network derived from existing computer programs. The network would provide the capability to access

the data bank from terminals at off-site locations. The computerized logistic data system currently in use at IBM for the BQQ-5 sonar would be adapted for LAMPS.

First we see the concept of a board for "strategic planning" as may occur in a university with the Board of Regents or in a hospital with the Board of Trustees. (15:120) Here the policy would be made for implementation by functional managers. The strategic level must relate the project objectives to needs of its environment. The environment in this case being the operational fleet units, the training commands, the supply corp and strategic documents like the operational requirement document or development concept paper.

Next we see a recognition of the need to provide greater influence to logistics considerations in system design engineering. However, the approach described cannot insure integration since many of the inter-unit difficulties that arise between engineers and logisticians are the product of psychological forces.

> Such forces operate in organizations toward the establishment of informal patterns which influence and alter formal ones. Achieving greater integration, therefore, involves not only a rational redesign of the formal organization, but also psychological procedures which improve communication and mutual understanding among the sub-groups within the organization, and thereby inable them to fulfill organizational goals more effectively. (16:17)

The company project manager must observe closely the interaction of these two critical sub-units that have a tradition of poor cooperation and take the necessary steps to create informal parity to complement the formal parity that has been proposed.

Lastly we see the inevitable appearance of the IBM computer in a logistics reporting system. The central data bank located at IBM facilities with extraction available to navy management through network terminals. I am concerned about whether the system will be merely "a mechanism for cluttering managers' desks with costly, voluminous, and probably irrelevant printouts" (17:85) or whether it will provide exactly the sort of information navy managers will need. William Zani argues that an effective system, under normal conditions, can only be born of a carefully planned, rational design that looks down from the top, the natural vantage point of the managers who will use it. Since navy management is at the top, has the contractor accurately predicted top managements' needs, or will considerable change be necessary before effectivity is achieved?

Tracking and Reporting System

Due to the anticipation of a large volume of data IBM proposed an automated system. This system would provide concise information on the status of each major element of performance, cost and schedule. All reports and data items related to the contract would be monitored and controlled.

Major milestones, conforming with the LAMPS master schedule, would be selected to highlight significant measurable points. These milestones would then remain fixed throughout the life of the program unless the navy required change. Progress or tracking reports were to be submitted monthly with descriptions of accomplishments and problems. All items in the work breakdown structure to level three or four would be covered with lower level reporting for critical items of high risk.

Cost tracking would be provided directly from the company performance management system that had been certified as complying with the Cost/Schedule Control Systems Criteria (C/SCSC) of Department of Defense Instruction 7000.2.

The tracking and reporting system would be implemented on a computerized interactive network consisting of a common data base located in an IBM computer center serving multiple users via remote terminals. A company time-sharing technique was proposed that would use remote communicating terminals to tie

the multifacets of the LAMPS program into a closed-loop management system. Each functional area would perform its unique tasks, but other users would have direct access to all data. It was recognized that strict control of inputs would be necessary to preserve the integrity of the file. IBM had been using this time-sharing system on other programs and seemed to have a good idea of the potential problems.

The time-sharing configuration allows consoles to be located on the user's premises. These consoles are tied into a large, general-purpose IBM computer (by means of telephone lines) which can perform a variety of tasks. Although no classified material would be maintained in the data bank or transmitted over phone lines, multiple levels of security would be applied to prevent unauthorized persons from access.

It became obvious in studying the automated tracking and reporting that IBM knows well the mechanics of implementing such a system. The advantages of the system are quite apparent and one is left to wonder only about any excessive cost features. I believe the system will be of much value to the navy project office and should serve to enhance coordination of activities between the government and the contractor. But I feel that it will be necessary to continually challenge the system for as Curtis Jones has noted (18:147) "the history of the computer is crowded with prophecies that it

will have a major impact on the management of enterprises. So far most of this impact has failed to materialize to the extent predicted."

SUMMARY

I have tried to highlight some of the major elements of IBM's management approach to the LAMPS system prime contractor task. Their organization was discussed with recognition of the unique properties that offered success. Use of higher management and technical skills to augment the company project office reflected their experience with project management and its limitations. "Projectizing" alone was not expected to guarantee success. Their employment of a "Mr. Inside" and a "Mr. Outside", with the deputy project manager located at the customer's residence is acknowledgement of the fact that project manager's can not be in two places at the same time, but that customer response must not suffer as a result.

Recognition of the magnitude of the GFE problems that the system prime contractor will face is embodied in their Interface Manager. This position will be expected to accomplish agreements with such major concerns as: United Aircraft and Boeing on the helicopter; Litton Industries on the DD-963 destroyer; Bath Iron Works on the FF (patrol frigate); and Newport News Shipbuilding and Dry Dock on the DLG(N)-38 guided missile cruiser. Also, there will be many small GFE suppliers and sub-contractors to be coordinated. The Interface Manager must be highly accessible to encourage the interchange so important to the system integration effort and mobile enough

to maintain a close relationship with the distributed activities involved.

Concern for logistics is expressed and manifested in their organization through the ILS manager. The need for close coordination with the navy is acknowledged and provided for through the Weapon System Logistics Integration Board.

It is apparent throughout that IBM appreciates the magnitude of the challenge presented by the LAMPS program. It knows it must face the task of integrating GFE helicopters with GFE ships of various types and in varying degrees of development. It has the tools readily available from past programs, but these tools need to be tailored to the LAMPS requirement. Computer models and routines for tracking cost, schedule, performance configuration and logistics must become operational quickly. Then IBM can begin to gain the visibility and control it will need to exercise total system responsibility. This is its ultimate value to the navy.

When the navy is confident that IBM r ached this point, it will be able to release laboratory personnel to concentrate on areas of new technology. But the navy can never ignore its ultimate responsibility for the LAMPS program and must exert its influence upon GFE contractors to garner their cooperation. It must be able to convince them that their efforts are appreciated and their contributions will be recognized. It must make clear to organizations within the navy what the objectives of the program are and gain their support.

Lastly, there must be a realization that all of the

planning will be wasted if people are ignored. Personalities, ambitions and prejudices must be overcome by an esprit that only the navy project office can create. The programming of people is still the main function of management and the programming of computers is child's play by comparison.

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